HELMHOLTZ SPITZENFORSCHUNG FÜR GROSSE HERAUSFORDERUNGEN

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MODEX Net

Comparison of Electricity Grid Models in the European Context – Insights from the MODEX-NET Project

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Research Topic

Identify and analyze the differences between 8 different electrical transmission grid models, by means of optimizing harmonized scenarios. This includes a comparison of the following aspects:

- Methodological principles
- Grid topologies
- Power data (generation, demand and storage)

Special attention is paid to the role of flexibility of generation and demand.

The results will be used for validation of the models, increasing their significance regarding the energy system transition.

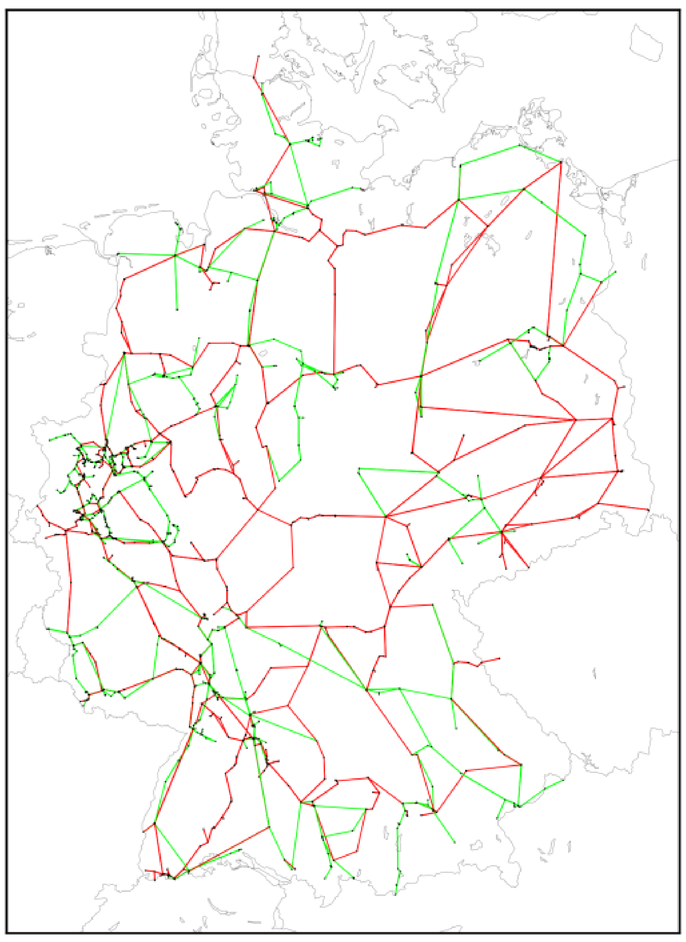

Fig. 1. High voltage German transmission grid as modeled in open_eGo.

Project Partners and Models

1.	FZJ GmbH - IEK3	EuroPower
2.	KIT - iip	Perseus
3.	RWTH - IAEW	MarS / ZKNOT
4.	Öko-Institut e.V.	PowerFlex
5.	DLR - VE	open_eGo / eTraGo
6.	TU Dortmund - ie3	MILES
7.	FfE e.V.	ISAaR
8.	TU Dresden - EE2	ELMOD

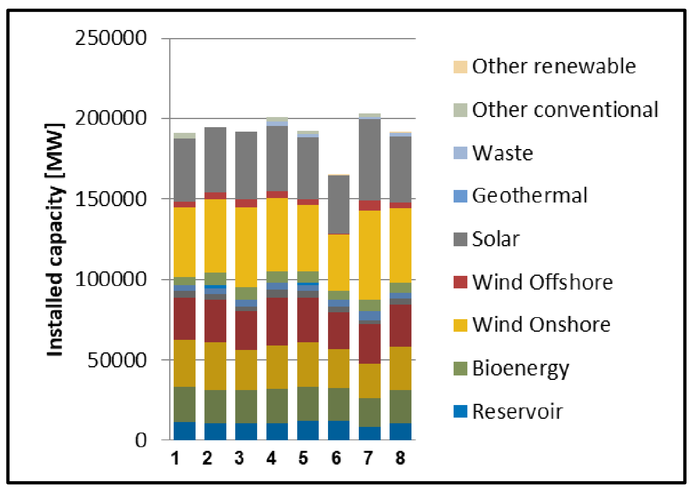

Fig. 2. Comparison of installed power capacity in Germany.

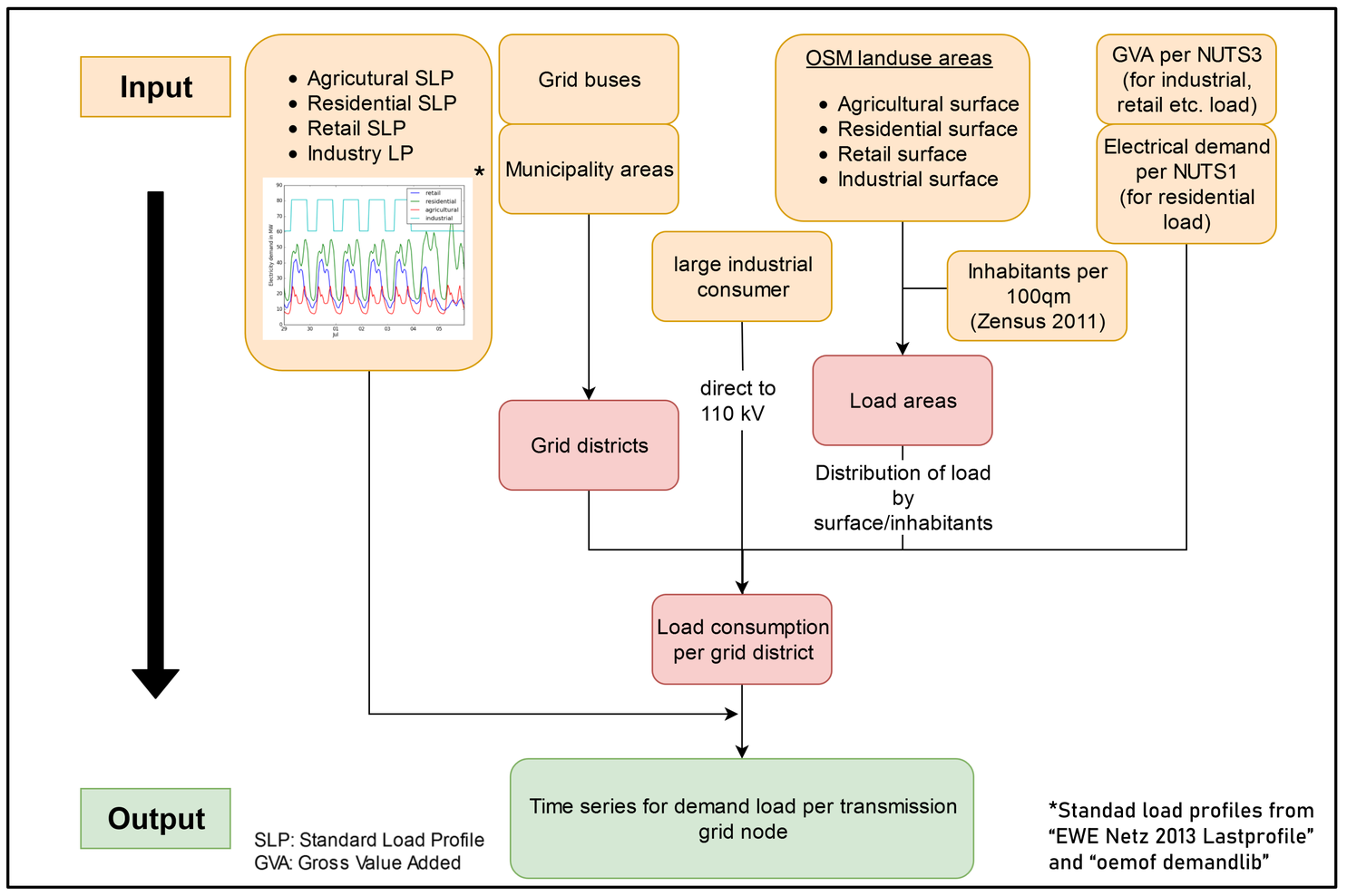

Fig. 5. Workflow of the demand regionalization in the open_eGo model.

Preliminary Comparison and Scenario Design

- Identify the parameters available in each model.
- Compare the following data:
  - Grid topology (Figure 1)
  - Generation (Figures 2 – 4)
  - Demand
  - Storage
- Compare the methods for the disaggregation of electricity generation and demand (Figure 5).
- Design the harmonized scenarios (for 2016 and 2030) to be optimized.
- Evaluate the difficulty and the impact of different harmonization possibilities for each component of the models.

	1	2	3	4	5	6	7	8
1	1,00	0,96	0,95	0,97	0,97	0,97	0,91	0,97
2	0,96	1,00	0,97	0,98	0,98	0,98	0,93	0,98
3	0,95	0,97	1,00	0,97	0,96	0,96	0,95	0,97
4	0,97	0,98	0,97	1,00	0,98	0,97	0,94	0,99
5	0,97	0,98	0,96	0,98	1,00	0,98	0,92	0,97
6	0,97	0,98	0,96	0,97	0,98	1,00	0,90	0,96
7	0,91	0,93	0,95	0,94	0,92	0,90	1,00	0,95
8	0,97	0,98	0,97	0,99	0,97	0,96	0,95	1,00

Fig. 3. Pearson correlation of installed capacities distributed per federal state.

Optimization and Analysis (until the end of 2021)

- Perform the power flow and the market optimizations.
- Analyze the optimization results and do some sensitivity analyses to enhance the model comparison.
- Determine the most sensitive parameters of the models.
- Publish the results in a special issue with the other MODEX projects.

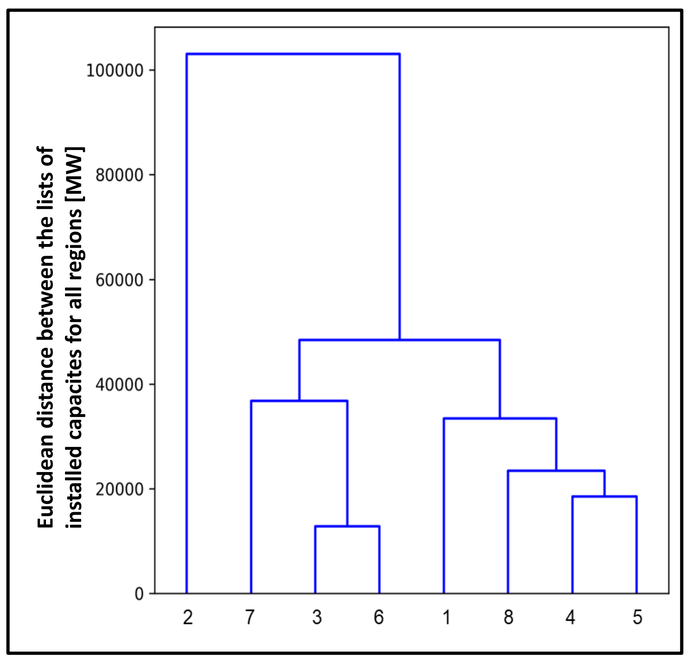

Fig. 4. Dendrogram of the clustering of the model installed capacity data.

Acknowledgments

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